EQW
2114

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	Group Art Unit:
Una QUINLAN	Examiner:
Appln. No. 09/924,955	**TRANSMITTAL**
Filed: August 08, 2001	
For: DIAGNOSIS OF LINK FAILURES IN A NETWORK	**Customer No. 30349** Jackson & Co., LLP 6114 La Salle Ave., # 507 Oakland, CA 94611-2802

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail, in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on June 6, 2005.

Seong-Kun Oh

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Enclosed please find the following:

1. Transmittal (in duplicate);
2. Certified Copy of Priority UK Application No. 0020004.8 filed 08/14/00;
3. Certificate of Mailing (in duplicate);
4. Deposit Account Authorization (in duplicate); and
5. Postage paid Return Post Card

Respectfully submitted,

JACKSON & CO., LLP

June 6, 2005
(Date)

By:
Seong-Kun Oh
Registration No. 48,210

(TC-04-05)

Attorneys for Applicant(s)

OIPE JC103
JUN 0 9 2005
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	Group Art Unit:
	)	
Una QUINLAN	)	Examiner:
	)	
Appln. No. 09/924,955	)	**SUBMISSION OF**
	)	**CERTIFIED COPY OF PRIORITY**
Filed: August 08, 2001	)	**DOCUMENT**
	)	
For: DIAGNOSIS OF LINK FAILURES IN	)	**Customer No. 30349**
A NETWORK	)	Jackson & Co., LLP
	)	6114 La Salle Ave., # 507
	)	Oakland, CA 94611-2802

CERTIFICATE OF MAILING
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail, in an envelope addressed to:
Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450
on June 6, 2005.
Seong- Kun Oh

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Enclosed is a certified copy of UK Application No. 0020004.8 filed August 14, 2000, and to which priority has been claimed in the above-referenced application.

The Commissioner is hereby authorized to charge any additional fees (or credit any overpayment) associated with this communication and which may be required under 37 CFR §1.16 or §1.17 to Deposit Account No. 50-2019. **A duplicate of this transmittal is attached.**

Respectfully submitted,

JACKSON & CO., LLP

June 6, 2005
(Date)

By:
Seong-Kun Oh
Registration No. 48,210

(TC-04-05)

Attorneys for Applicant(s)

INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

CERTIFIED COPY OF PRIORITY DOCUMENT

the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the mptroller-General, hereby certify that annexed hereto is a true copy of the documents as ginally filed in connection with the patent application identified therein.

o certify that the attached copy of the request for grant of a Patent (Form 1/77) bears an ndment, effected by this office, following a request by the applicant and agreed to by the ptroller-General.

cordance with the Patents (Companies Re-registration) Rules 1982, if a company named certificate and any accompanying documents has re-registered under the Companies Act with the same name as that with which it was registered immediately before re- ation save for the substitution as, or inclusion as, the last part of the name of the words limited company" or their equivalents in Welsh, references to the name of the company ertificate and any accompanying documents shall be treated as references to the name ich it is so re-registered.

I dance with the rules, the words "public limited company" may be replaced by p.l.c., p .C. or PLC.

Re ration under the Companies Act does not constitute a new legal entity but merely sub he company to certain additional company law rules.

Signed

Dated 18 January 2005

Patents Form 1/77

Patents Act 1977
(Rule 16)

THE PATENT OFFICE
14 AUG 2000
RECEIVED BY HAND

The Patent Office

1/77

15AUG00 E560797-4 D00016
P01/7700 0.00-0020004.8

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP9 1RH

1. Your reference	HRW/sb/3Com2764GB	
2. Patent application number *(The Patent Office will fill in this part)*	14 AUG 2000	**0020004.8**
3. Full name, address and postcode of the or of each applicant *(underline all surnames)*	3Com Corporation 5400 Bayfront Plaza, M/S 1308 Santa Clara California CA 95052, USA	
Patents ADP number *(if you know it)*	07714447002	
If the applicant is a corporate body, give the country/state of its incorporation	Delaware, USA	
4. Title of the invention	Diagnosis of Link Failures in a Network	
5. Name of your agent *(if you have one)*	~~BROOKES & MARTIN~~	
"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	~~HIGH HOLBORN HOUSE 52-54 HIGH HOLBORN LONDON WC1V 6SE~~	Brookes Batchellor LLP 102 - 108 Clerkenwell Road LONDON EC1M 5SA **ADP No. 08839276001**
Patents ADP number *(if you know it)*	471001	AB 18/1/05

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number	Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:* *a) any applicant named in part 3 is not an inventor, or* *b) there is an inventor who is not named as an applicant, or* *c) any named applicant is a corporate body.* *See note (d))*	Yes

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	-
Description	5
Claim *(s)*	-
Abstract	-
Drawing *(s)*	3

10. If you are also filing any of the following, state how many against each item.

Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	-
Request for preliminary examination and search *(Patents Form 9/77)*	-
Request for substantive examination *(Patents Form 10/77)*	-
Any other documents *(please specify)*	-

11. I/We request the grant of a patent on the basis of this application.

Signature

Date 10 August 2000

12. Name and daytime telephone number of person to contact in the United Kingdom

Hugh R Wright 01892 510600

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.

b) Write your answers in capital letters using black ink or you may type them.

c) If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.

d) If you have answered 'Yes' Patents Form 7/77 will need to be filed.

e) Once you have filled in the form you must remember to sign and date it.

f) For details of the fee and ways to pay please contact the Patent Office.

DIAGNOSIS OF LINK FAILURES IN A NETWORK

The present invention relates to the diagnosis of link failures in a network.

There are various standard protocols for operation of a network. We will be describing an arrangement which uses Ethernet in the gigabit range (protocol IEEE 803.2 – 1000BASE-X), although the principle may be applied to other protocols.

As is well known, 1000BASE-X networks operate on optical fibre full duplex links. Under the IEEE Standard 802.3, two devices when initiating communication with one another across a network ("handshaking") allow the devices to exchange information about their abilities. At its simplest, it is necessary for the two devices to be aware of the level (eg speed) of protocol at which they each operate so as to chose the highest speed protocol common to each of them. This process which involves the exchange of "pages" of information with each other, and which is referred to as auto-negotiation thus provides automatic speed matching for devices which are capable of operating at a variety of speeds in accordance with a variety of protocols.

Link failures may happen in a network at any time and various proposals have been made to determine the cause of such link failures. However, there is a particular problem in a special circumstance as follows. When a manufacturer designs a new component to operate in such a network in accordance with a pre-determined protocol, it is sometimes found that there are problems whereby the new component does not link properly with the reminder of the network. Two matters can make identification of a problem more difficult. The device never connects properly and the protocol is a new one.

The difficulty in this particular case is that one has little experience to determine what the problem might be, particularly if the link does not start or simply goes down. Examples of link failure are:

loss of light;

bit/word alignment failure;

loss of synchronisation during auto-negotiation;
auto-negotiation protocol hang during base page exchange;
auto-negotiation protocol hang during next page exchange;
auto-negotiation protocol (repeated) restart due to link partner initiating a "break link".

In copper or optical fibre links, the management interface to the PHY device (physical layer) provides minimal visibility of link failures. So far as the interface is concerned, the link is either "up" or "down" or "was down but has since come up". Testing one manufacturer's products ability to co-operate with another competitor's products using the relevant protocol can render it difficult to isolate faults when failure occurs.

There are networks analysers which can be purchased, which offer link diagnostic capabilities, but such device do not usually exist in the early stages of a new protocol, for example gigabit Ethernet. Also such devices do not necessarily reflect the true state of the link nodes. There is a particular problem in understanding auto-negotiation breakdown.

A preferred embodiment of the invention will now be described by way of example only and with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic view of a network containing a plurality of devices and in particular a device under test to test its compatibility with other devices.
Figure 2 is a diagram of the physical layers of two of the devices, including said device under test, linked to one another, and
Figure 3 is a simple flow chart of the sequence of operations carried out by the device and/or the software to identify and diagnose link failure.

Figure 1 is a diagrammatic view of a network. The network is shown at 27, and it attached to a known device B having registers 23 as will be described later. A network management system is provided at 21, and there is provided software 25

which may be provided on the management system 21. The software 25 passes signals to a visual display unit 26.

A new device A is connected to the known device B and also to the management system 21. In use the management system receives signals from the new device A, the known device B and the remainder of the network 27 and utilises the software 25 via line 22, the software 25 providing a suitable output for the visual display unit 26.

Figure 2 illustrates the Open System Interconnection (OSI) model for the relevant parts of the communication ports one each of the two devices A and B. As is well known, each layer of the OSI model performs a specific data communication task and there will be communication between the corresponding layers of the two devices. The relevant information passes down the stack of layers down to the physical layer which in this case is the fibre optic 20.

As is clear, device A is drawn in the substantially standard manner of a seven layer OSI model, the bottom three layers of which are of significance in the present application and comprise the physical layer A1, the MAC (Media Access Controller), data link A2 and the IP layer A3. Device B is similar but it should be noted that the physical layer in device B is sub divided into layers B1.1, B1.2, B1.3, B1.4.

Thus in layer B1.1 there may be provided signal detector logic, in layer B1.2 comma alignment and receive synchronisation, in B1.3 there may be a bit error counter, and in layer B1.4 there may be provided the auto negotiation state machine which deals with the exchange of one or more pages of information between the two devices, handles link restarts by the link partner, and reports the link state and hangs.

As is well known, where a device is a managed device, it will conventionally contain a semi-conductor device 21 which holds a so-called device manager, the device manager monitoring the status of a link and data passing along the link. As is clear from Figure 2 and in line with Figure 1, the network management device 21 passes the information relating to the status of the link to the software 25 which then

suggests solution to the problems found. The network manager 21 receives information from B1.1 relating to signal detect failure, from B1.2 with respect to loss of synchronisation indications, from B1.3 a bit error count, and from B1.4 information regarding link restart reasons, base page exchange progress, and idle exchange in progress. In a practical arrangement, however, the device manager interrogates a series of status registers which will store the information relating to these various functions.

It will be noted that with respect to device A, the arrangement is a normal arrangement in which the physical layer A1 simply provides information stating whether the link state is up or down or was up and in now down.

Referring to Figure 3, the software 25 is adapted to carry out the following functions.

Thus, the software will, on receiving a signal from the network manager 21 via link 22, interrogate the registers indicated at 23 in the device B. The software includes routines which are able to analyse the information from the registers 23, and to pass signals to VDU 26 to display thereon a message including a suggested course of action to overcome the problem.

Thus, for example, detecting from the relevant register that there has been a signal failure would cause the software in the computer 25 to indicate on the VDU 26 that there is a physical link failure and suggest checking for a break in the fibre or poor connection at either end.

Thus the software 25 in the network manager 21 operates as shown in Figure 3. When the management system detects a link failure or other fault (step 31), this is passed from the network manager 21 along link 22 to computer 25 which in step 32 checks and downloads the contents of at least some of the various registers. In a sub-routine, the information from the first register is then checked against a pre-determined standard in step 33 to determine whether it indicates an error. If the error

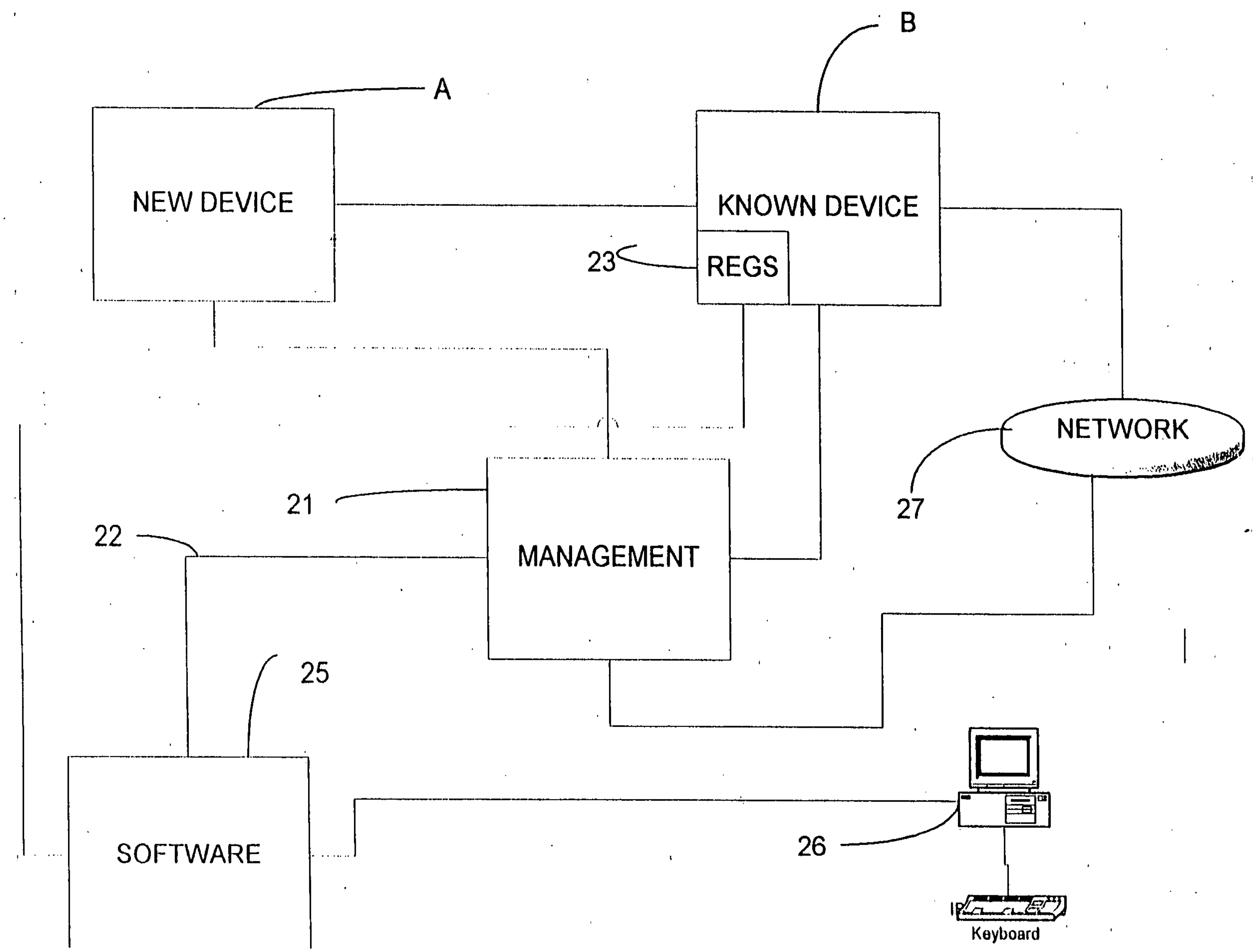
is indicated by the information in the first register, then in step 34 a suitable message is passed to the VDU 26 to display a proposed course of action in step 35.

If, however, the information in the first register does not indicate an error, then the software passes to the second step and looks at the information from the second register and if after carrying out a sub routine the software determines that that register contains error information in step 36, in step 37 a suitable message is passed to the VDU for display.

Figure 2 only indicates consideration of information from a first and second register in steps 33 and 36 but clearly there may be provided a number of other steps for considering information from other registers. If after consideration of the information from all of the registers a fault cannot be determined then in step 38 the VDU is instructed to display a message indicating that there is an unknown error.

Figure 3 shows the process at its simplest. Each step 33, 36 includes a sub routine which compares the relevant information from the register with known parameters; furthermore the software may provide a more intelligent answer in the sense that it may also review the contents of more than one register simultaneously since a particular type of fault may cause an error signal to be provided in more than one register.

The invention is not restricted to the details of the foregoing example.



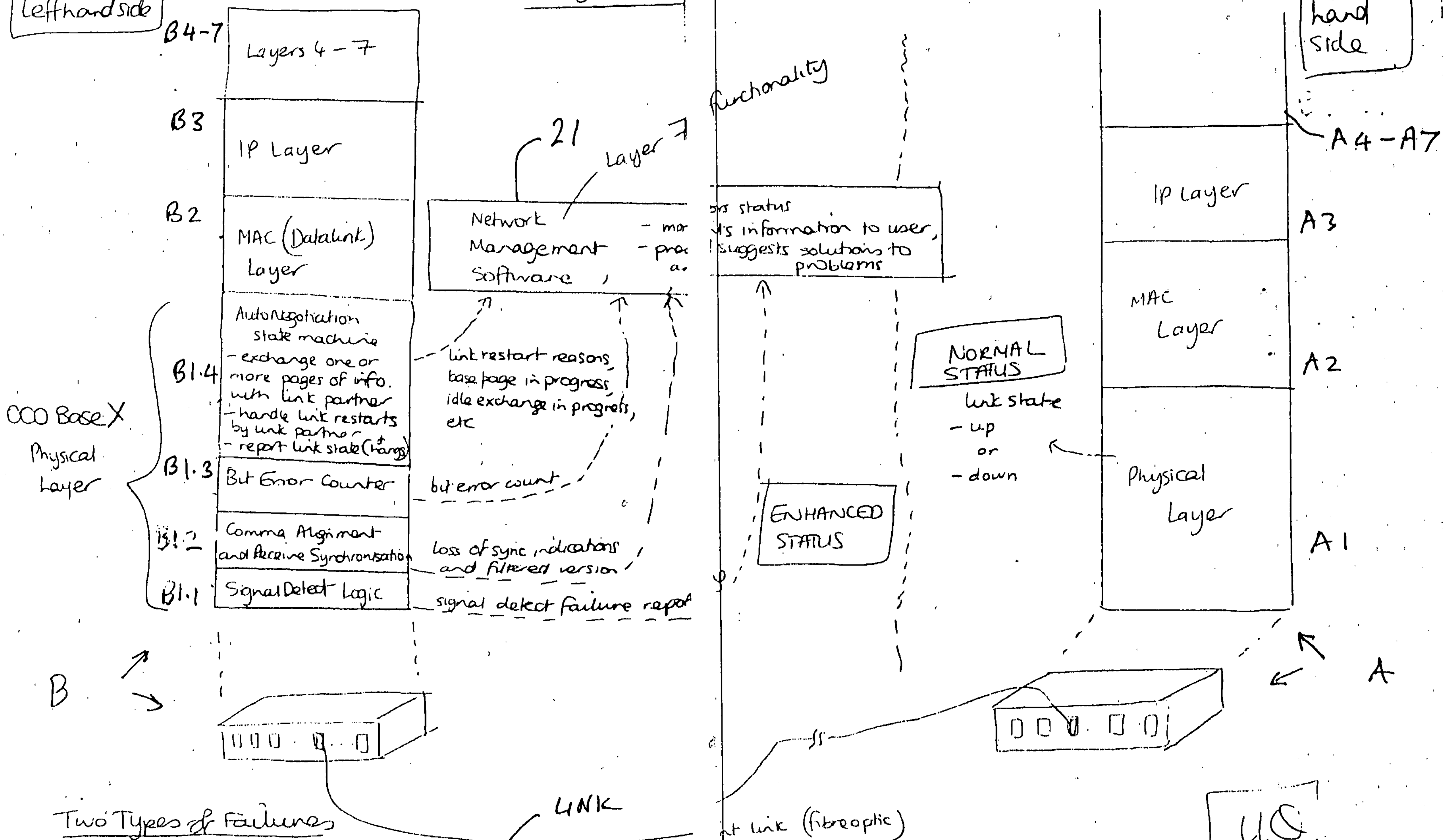
A
B
NEW DEVICE
KNOWN DEVICE
REGS
23
NETWORK
27
21
22
MANAGEMENT
25
SOFTWARE
26
Keyboard

FIGURE 1

Page 1 Lefthand side

Pc 1 Right hand side

Diagnosis of Link Failures Facilitated by reporting finer granularity of Physical Layer Status.



Two Types of Failures

1. Physical Link Integrity
2. Autonegotiation protocol errors

FIGURE 2

U.C 13/3/00

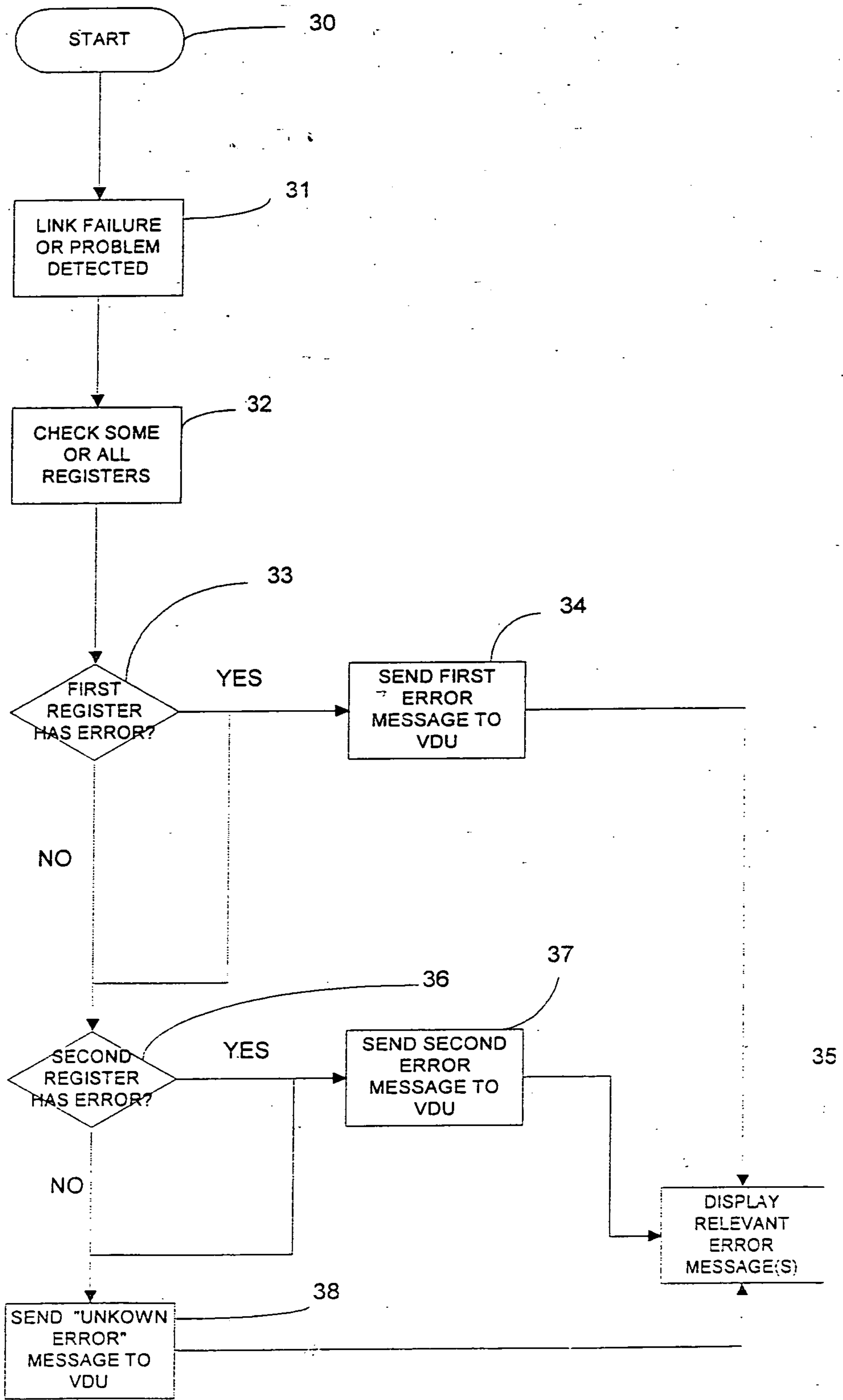

START
30
LINK FAILURE OR PROBLEM DETECTED
31
CHECK SOME OR ALL REGISTERS
32
33
34
FIRST REGISTER HAS ERROR?
YES
SEND FIRST ERROR MESSAGE TO VDU
NO
37
36
SECOND REGISTER HAS ERROR?
YES
SEND SECOND ERROR MESSAGE TO VDU
35
NO
DISPLAY RELEVANT ERROR MESSAGE(S)
38
SEND "UNKOWN ERROR" MESSAGE TO VDU

FIGURE 3